The Electrical Progress of the Year 1887.*

BY JOS. WETZLER.

In looking back upon the work done in the domain of electricity during the past twelve months, we are struck at once not only with the development which has taken place among the departments which are well established, but we are able to discern clearly that new paths have been broken which cannot fail to ultimately lead to rich prospects. On a similar occasion a year ago the writer had the honor to present to you the work that had been accomplished in electricity during the year, and while it would be invidious to draw comparisons between two years so full of novelties and of progress, it may be truly said that the year about to close has by no means been behind its predecessor in anything that relates to the advancement of the science and application of electricity. In the following paper the various branches of applied electricity have been grouped under certain heads in order that the record and comparison may be made more easy.

THE TELEGRAPH.

The jubilee of the telegraph, which was celebrated in England this year, marks an epoch in the history of this branch, and the comparisons made between the various speeds attainable at the beginning of telegraphic work and the present speak volumes for the ingenuity and perseverance shown by a host of seekers in this branch. This speed has now been brought up to such a pitch that, with improved methods, no less than 600 words per minute can be transmitted, whereas the early days showed that 15 or 20 words were considered high. Among the improvements which have taken place during the year we may notice the additional value which has been given to Edison's phonoplex telegraph system by an arrangement (1) by means of which the system is increased in extent, so that what was formerly a duplex is converted into a triplex telegraph. The arrangement is such that it is particularly applicable to lines on which there are a large number of intermediate stations, so that it is specially adapted to railroad work. In an improvement introduced in the ordinary Morse system by Absterdam (2), the signals sent are retransmitted automatically to the sending station, thus avoiding the necessity of retransmission for the verification of despatches. Robbins (3) has also introduced an improvement in telegraph lines such, that upon a break occurring in the circuit the line will be automatically grounded at the point of the break, thus permitting of a continuous working notwithstanding the break. In the domain of printing telegraphs we note the successful operation of a system devised by Brown (4), by means of which eight printing telegraph instruments were operated simultaneously over the same wire.

THE TELEPHONE.

In the field of telephony we may say that attempts have been made to increase as much as possible the volume of sound by increasing the electrical efficiency of the receiving instruments. Starting from this standpoint, Prof. Sylvanus P. Thompson has brought out an instrument which he calls a dynamo telephone (5) and which takes its name from the fact that it is constructed on the same principle as the dynamo-electric machine. This telephone is in fact simply a Gramme ring, the windings of which the currents traverse, and the movements of which, engendered by the currents, are transmitted directly to a diaphragm. The ring acts in fact like the armature of a motor.

Safford (6), on the other hand, has brought out a telephone in which a series of reeds are acted upon by the magnet, the idea being to provide a suitable receiver for a large range of pitches in the transmitted voice, it being argued that the single diaphragm is limited in its power to reproduce different pitches. Morton's telephone transmitter (7), brought out during the year, consists of a diaphragm of magnetized steel in which the layers of magnetism are superposed on one another, according to the method indicated by Hughes, and which shows no evident or external polarity. This piece of steel is placed opposite the coil, and, when spoken to, the impinging of the voice on the same disturbs the polarity of the molecules, and thus effects a change in the magnetic condition, which change generates a current in the adjacent coil.

The attempt to upset some of the claims which are maintained by some with regard to telephony, and the manner of transmitting and receiving speech, has led to the construction of not a few apparatuses designed to show the falsity of those claims. Thus, in England, Swinton (8), in order to avoid a diaphragm in connection with a telephone transmitter, has constructed an instrument in which the carbons are supported in a lead frame, which permits of no evident vibration. In this country a very ingenious apparatus has been brought out by Messrs. Stephen D. Field and Rudolph Eickemeyer for the purpose of proving the possibility of transmitting articulate speech by a make and break current (9). Heretofore, in apparatus constructed for that purpose, the makes and breaks have been produced through the medium, as it were, of the speaker's voice itself; but these inventors, in order to leave no doubt as to the absolute make and break, have constructed an apparatus in which these makes and breaks are performed automatically; and the speaker's voice acts to bridge or cut off certain parts of these makes and breaks, and thus to transmit the spoken words.

But while little improvement has been made in transmitting instruments themselves during the year, experiment has been quite active in the line of recording and reproducing articulate speech. Considering, first, the purely electrical ones, we may mention Irish's electro-thermal recording telephone or phontograph (10). This apparatus, briefly described, consists, first, of a transmitter, to the diaphragm of which is attached a wire which is heated by a current and which bears against a ribbon of paper drawn at a uniform rate before it. Upon speaking in front of the diaphragm, the heated wire is pressed to a greater or less degree into a strip of paper, and burns grooves into it to a depth corresponding to the amplitude of the vibrations into which the diaphragm is thrown. When it is desired to reproduce the speech thus recorded the paper strip is passed between two rollers in an electrical circuit, and between these rollers is placed the paper strip which is fed with carbon. The latter, entering the groove, forms the conducting path for the current between the rollers, and the amount of carbon present at each point, corresponding to the depth of the burnt groove, varies the resistance of the circuit in accordance with the original sounds spoken against the diaphragm.

In Hunter's repeating phonograph (11) a somewhat analogous arrangement is adopted, and it consists essentially in passing carbon paper under a stylus connected with the transmitting diaphragm, which compresses the paper in accordance with the words spoken; and this paper when placed in an electric circuit acts as a variable resistance in the circuit, due to the varying compression given to the same.

Of the non-electric phonographs we may mention that of Berliner (12), who has employed the method of the original phonograph of Leon Scott to give a photographic negative, which is subsequently employed for the purpose of obtaining a photo-engraving of the sound waves; the matrix thus obtained then serves as a guide for a stylus attached to the reproducing diaphragm.

Edison has also during the year perfected his phonograph of ten years ago, the principal improvement lying in the substitution of a wax cylinder on which the sound waves are engraved instead of the tin foil indented by the stylus, as of old. In connection with the instrument he employs an electric motor in order to obtain the desired regularity of speed, so essential in the reproduction of articulate speech by such instruments.

BATTERIES.

Notwithstanding the widespread use of the dynamo for the generation of electricity for all purposes, the study of the primary battery has not only by no means been neglected, but we may consider that a decided advance has been made during the past year, and several interesting forms which may develop into valuable adjuncts to our present sources of electricity have been devised. One of the most interesting of these is the carbon battery (13) of Willard E. Case. In the carbon battery heretofore employed, the carbon has constituted the negative or insoluble electrode, but in the present cell carbon forms the positive element, which is consumed, platinum forming the negative, insoluble element. The electrolyte consists of sulphuric acid to which chlorate of potash has been added, which forms peroxide of chlorine that attacks the carbon and gives off carbonic acid gas. The electromotive force of this cell is 1.25 volts. Mr. Case has also during the year brought out an improvement on his heat cell by which the conductivity of the precipitated tin is considerably increased by the addition of mercury to the same; which addition also makes a more uniform connection (14).

Lugo has during the year brought out a battery (15) for which great constancy is claimed. The elements are placed, respectively, in an alkaline and an acid solution, and the deposit of metal and the diffusion of liquids is prevented, it is claimed, by the addition to the acid of a metallic salt. Thus he places in the porous cup the electrode of carbon and nitric acid to which nitrate of copper has been added. In the outer jar is placed zinc in a solution of caustic potash. An electromotive force of 2.5 volts is said to be attained, and after 264 hours on short circuit the drop was only $\frac{1}{10}$ of a volt.

A modification of the Leclanché cell has been brought out by Sidney F. Walker (16), by the substitution of sulphur for the bi-oxide of manganese. It is claimed that all the work in the cell is done at the expense of the sulphur, sulphureted hydrogen being formed during the action of the cell. The electromotive force of the cell is lower than that of the ordinary Leclanché, but it is also said to have a lower resistance.

Finally, we must draw attention, among the primary batteries, to a new class of voltaic combinations in which the oxidizable metals are replaced by alterable solutions. In these cells, solutions are oxidized, and act as electrodes instead of the usual oxidizable metals, such as zinc. It has been suggested in this connection that electric currents might also arise in a similar way in the animal body between the venous and arterial blood, and experiment has confirmed this.

Coming now to the department of secondary batteries, we find many modifications of older forms designed to increase the capacity, or other point of efficiency, of the storage battery; thus, in order to obtain greater conductivity and to prevent the falling out of the active matter from the grids, as usually made, Van Gestel has brought out a battery the plates of which consist of a spiral which is made up, as follows: In the centre a copper wire covered with lead; this is surrounded by a leaden tube, and the intervening space is filled up with the active material. The outer tube is perforated so as to permit of the circulation of the liquid in the interior (18).

Meserole has called attention to a secondary battery (19) which is said to give an electromotive force of three volts, and which consists of zinc and lead plates which are placed respectively in a solution of mercuric sulphate, zinc sulphate, and free sulphuric acid. He has also drawn attention to the fact that the forming process of the ordinary lead cell is favored by the addition of sulphate of manganese to the usual sulphuric acid solution, which addition gives rise to the formation of permanganic acid (20).

Reckenzaun has brought out a modification of the ordinary lead cell (21) consisting in the casting of lead around prepared cylinders of active material. To prevent the hard plates from cracking when immersed in the solution in order to be formed, Hering (22) employs a binding material of a stable lead salt which is ultimately converted into lead oxide. In order also to make the plates more porous he adds sugar to the active material which is dissolved out before the plates are formed.

The experiments made by Peyrusson (23) appear to show that the action in the storage battery is stronger when tin or cadmium are in solution in the electrolyte. In the Phœnix cell (24), brought out by P. Bailly during the year, lead wool is employed, which is cast around a grid of lead, in order to obtain a good conducting mass. Desmazures (25) has also made experiments with a battery consisting of zinc and compressed copper as the electrodes. The electromotive force obtained is .85 volt.

DYNAMOS.

The high state of perfection to which dynamo-electric generators had already been brought hardly affords much scope for improvement as regards the increase of efficiency *per se*; in consequence of this, the attention of inventors has been chiefly directed to the increase of the output of dynamos per pound of material, and we may say generally, that strange as it may seem, there seems to be a drift toward decreasing the speed of dynamos, and, in consequence of the change, a number of multipolar machines have been brought out in the course of the year, among which we may mention that of Bradley (26), in which, with a continuous winding, there are only two circuits in multiple arc, and in which three pole pieces are employed.

In the Patten dynamo (27) the same object is sought to be obtained by revolving both field and armature, by which means the speed of rotation of each part is reduced to one-half of what would be required if either one were revolved singly. This machine is arranged to give either continuous or alternating currents. Siemens and Halske, and some others, have also brought out a machine in which the armature in the shape of a Gramme ring is stationary, and within which revolve the magnets, presenting four poles to the surrounding armature.

Various forms of iron-clad dynamos have also been brought out during the year, among which we may mention those of Eickemeyer (28) and Lahmeyer (29). In the Oerlikon dynamo a novel feature is the insertion of the armature wire below the surface of the iron (30).

Mention must also be made of a new method of regulation brought out by Trotter (31), which consists in adding an armature across the pole pieces, which acts as a magnet shunt to the iron of the armature itself, and the magnetic resistance of which is varied in accordance with the resistance in the external circuit, so as to keep the current constant.

THE ELECTRIC LIGHT.

The prominent feature of the year in electric lighting is the number of systems of distribution by means of induction transformers which have been brought out or elaborated. Prominent among these are the Westinghouse system (32), in which alternating currents are employed. But mention must also be made of a number of systems in which the interrupted continuous current is employed for the same purpose of reducing the potential through the medium of induction coils of various forms. Among these we note the system of Pfannkuche (33), who employs reversed continuous currents in connection with secondary induction coils, and the system of Bollman (34), which is somewhat similar to the above, but in which the induction coils are provided with only a single winding and coupled up in such a way as to reduce the electromotive force to the desired point. Another means of effecting distribution at high potential has been worked upon during the year, which consists in the employment of motor dynamos—that is, machines provided with two windings of high and low resistance, respectively, the former acting as a motor winding, which revolves the armature and causes the generation of low tension currents in the winding of low resistance.

Among the systems of regulation Prof. Elihu Thomson has indicated an ingenious method of regulation of the three-wire system (35). By this method a motor dynamo having two similar windings which are respectively connected with the two sides of the circuit, acts to supply the unbalanced side with current taken from the side which has an excess of current.

In the department of the measurement of electricity, we find several new forms of meters and potential indicators. Among the integrating meters we find Aron's (36) the action of which depends on the registering of a differential clockwork gear acted upon by two clocks, one a standard, and the other subjected to the influence of the current passing through the meter.

The Forbes meter (37) depends on the heating action of the electric current passing through a wire, the heat generated causing the flow of air currents which sets in motion a light mill wheel, the revolutions of which are recorded by a registering train. Wood (38) and Waterhouse (39) have brought out indicating instruments which depend upon the repulsion of the magnetic poles of like polarity, instead of the principle of attraction usually employed. The indications of these instruments for equal increments of current or potential are remarkably proportional.

To avoid the blackening of incandescent lamps, due to the separation of the carbon from the filament, Thompson has (40) patented an arrangement by which there is inserted into the lamp an insulated wire, connected to the ground and provided with sharp points upon which the carbon separated from the filament is claimed to be discharged, thus preventing its deposit on the sides of the globe.

ELECTRIC MOTORS AND RAILWAYS.

The year 1887 has been eminently fruitful in the large number of electric railways undertaken and in the new systems brought out. In so far as the electric motors themselves are concerned, a number have made their appearance, which, as in the case of the dynamo, chiefly present modifications of details intended to increase their efficiency, and among which we may mention those of Baxter (41), Immisch (42), Silvey (43), the Cleveland (44), Card (45), Hyer (46), Thone (47), C. & C. (48), etc.

But in the department of railway work sufficient has been done to warrant a more detailed description in not a few cases. Thus early in the year Mr. Stephen D. Field made public a system of his which is designed especially for street railroad work (49). In this system two conduits are employed, the tops of which form the bearings for the rail, the flange on the wheel entering the slot in the top. In each of these conduits an insulated conductor is placed, each one of which is connected to a dynamo placed at each end of the line. The conductor in one conduit is connected with the positive brush of the dynamo, the negative brush of which is connected to the ground; and the other conductor is connected to the negative brush of the dynamo at the other end of the line, the positive brush being connected to ground. By this means two potentials can be obtained, viz., that between the two conductors themselves, that is, between the positive and negative brushes of the two dynamos; or, the difference of potential due to one dynamo alone. The one potential is obtained by connecting across the two conductors themselves, while the second, lower potential, is obtained by connecting one conductor and the ground. Thus, in case of the failure of one machine, the other is still able to maintain traffic on the line; by this arrangement also the resistance of the line is kept uniform, no matter what may be the position of the car upon it. Mr. Field has also carried out a series of ex-

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periments with a motor designed especially to be employed on the elevated railroads in New York City (50). The connection between the armature shaft and the driving wheels is a direct one, the ordinary locomotive parallel bar being employed for that purpose.

Another system which deserves attention is the series electric railroad system of Short & Nesmith (51), which has been put in operation at Denver, Col. In this system the current is kept constant, instead of the potential, as usual, and the car as it travels along makes and breaks contacts,

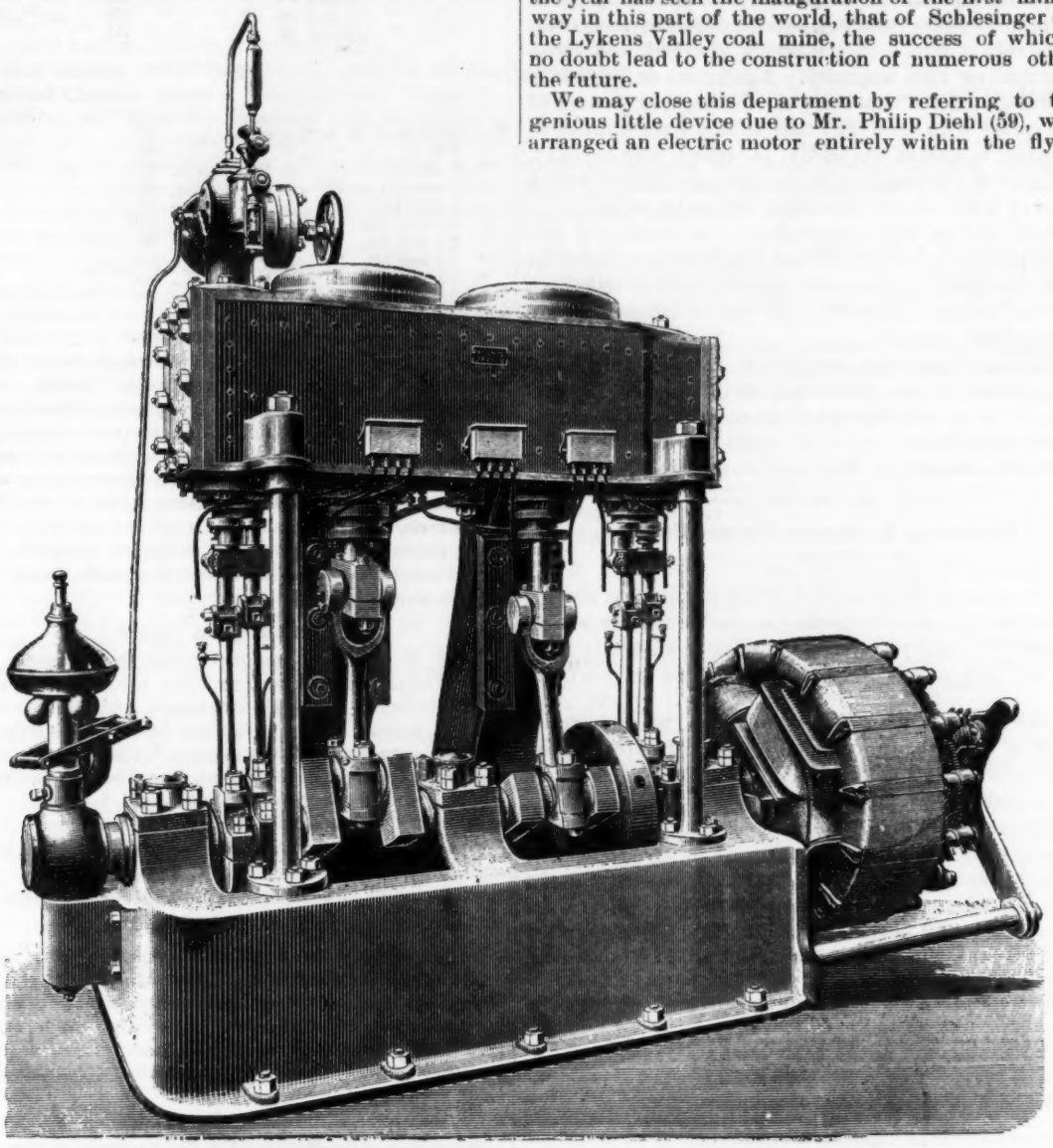


FIG. 1—SIEMENS' RING DYNAMO DIRECTLY CONNECTED WITH ENGINE.

which forces the current to pass through the motor on the car.

To avoid the use of a slotted conduit, several systems have been brought out during the year in which the electric connection between the car and the conductor is effected without the employment of a slot. Among these we may mention that of Pollak and Binswanger (52). In this system an insulated conductor is buried in the ground, and at suitable short intervals branches are laid into switch-boxes, which are placed directly under a conducting rail upon the surface. Contact wheels bear upon these conducting rails which normally have no current passing in them. Upon the car, however, is carried a magnet which acts upon an armature placed in the contact boxes below the surface, and by the attraction of which the armatures are raised. This closes a contact which connects the surface conducting rail with the main insulated conductor below the surface, which then furnishes current to the motor on the car. As soon as the car has passed these points, the armature in the contact box is released, and the connection broken, whereupon a similar connection takes place at the next contact box; and thus a continuous current for the motor is obtained. Hence the surface conducting rail only affords a local circuit and may be said to be a traveling conductor, energized only at the point where the car happens to be at any particular moment.

Another device intended to overcome the use of a slot is that of Irish (53), in which a flexible conduit permits connection to be made with a surface conducting rail and the conductor within the conduit.

We must also mention here the elevated railroad experiment of Sprague (54), as well as the system of Enos (55), designed for elevated railroads. Not a little attention has been devoted during the year to the various methods of gearing the motor to the axles of the car, and an excellent résumé of these has been given by Mr. A. Reckenzaun (56) before the American Institute of Electrical Engineers. Before that body, also, a valuable statistical table of the electrical railroads of America and Europe has been given by Mr. T. C. Martin (57). It is specially worthy of note that the year has seen the inauguration of the first mine railway in this part of the world, that of Schlesinger (58), in the Lykens Valley coal mine, the success of which will no doubt lead to the construction of numerous others in the future.

We may close this department by referring to the ingenious little device due to Mr. Philip Diehl (59), who has arranged an electric motor entirely within the fly wheel of a sewing machine, thus making it an integral part of the same.

THERMO-ELECTRICITY.

It is indeed a significant proof of the progress made during the past year, that the subject of thermo-electricity should furnish sufficient material to be included under a separate heading; yet such is undoubtedly the case, for we may say that a decided impetus has been given to a subject which has lain practically dormant for over 50 years. It has long been shown that the principle of the old thermopile is capable of furnishing current through the medium of heat only at a very great loss, hence it followed that, for producing a practical electric generator some some other principle must be employed. These considerations have led several prominent inventors to the consideration of apparatus in which heat is employed in connection with magnetism to effect the generation of electric currents. Both Edison (60) and Berliner (61) have, during the past year, published descriptions of machines which may more properly be called thermo-magneto-electric generators, and in both of which the varying magnetic capacity of iron at different temperatures is made the basis of action. The principle employed, briefly stated, is, that an electro-magnet, when heated to a high temperature, loses its magnetism and obtains it again when cool; if this operation be repeated in rapid succession, the change of the magnetic state will excite corresponding currents in a surrounding conductor, and will thus convert the energy of the heat into current through the medium of magnetic action. In both the Edison and Berliner apparatus a blast of air is employed for cooling the magnetic metal which is heated by a furnace. Edison has further applied the same principle to the construction of a motor, although, as was to be expected, certain mechanical difficulties have presented themselves. It is not unlikely that the principle here employed may lead to a practical form of electric generator. The principle that has just been stated, however, is not the only one which has been worked upon during the year, since others have also been the subject of experiment. Thus Acheson (62) has quite recently brought out an apparatus in which the old thermo-electric principle is applied in connection with but a single metal. The apparatus depends upon the fact that a current is set up between two points at different temperatures, on the same piece of metal. By Mr. Acheson's arrangement the temperature of these two points may be kept at a considerable difference by the employment of an intermediary conducting substance which by its nature is prevented from exceeding a certain fixed temperature. Thus, in one form of apparatus he uses water as the intermediary substance, and in the other he employs a hot gas in connection with bioxide of manganese. Still another apparatus of Mr. Acheson's is constructed on a principle which he claims to have discovered, namely, that if magnetic whirls be set up in a conductor while the same is under the influence of heat a current is generated in the same (64). This apparatus in some respects suggests certain analogies to the experiments of Hinghausen and Nerust (63), brought out in the early part of the year. These latter experimenters have shown that if a slip of metal, placed under the influence of a magnet, be heated, a difference of potential is set up at its ends, which can generate a current in the external circuit. The action, however, in that case is quite feeble.

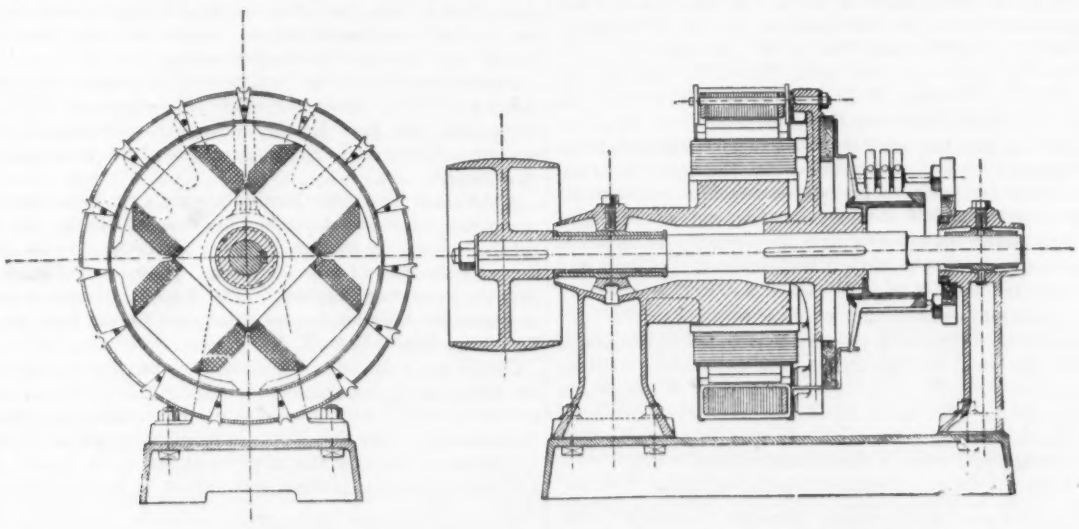
SCIENTIFIC INVESTIGATION.

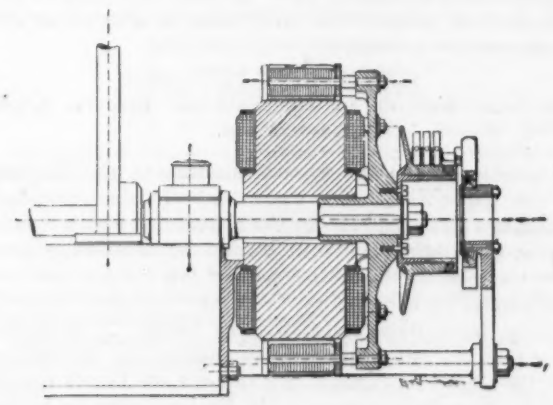
The scientific investigation in the field of electricity during the year might easily fill columns, and hence only the merest outlines can here be given. Among the most interesting investigations are those made by Prof. Elihu Thomson on the action of alternating currents (65), in which he demonstrates that an alternating current circuit or coil repels and attracts a closed circuit or coil placed in direct or magnetic inductive relation therewith; but the repulsive effect is in excess of the attractive effect, so that when the closed circuit or coil is so placed and is of such low resistance metal that a comparatively large current can circulate as an induced current, so as to be subject to a large self-induction, the repulsive effort considerably exceeds the attractive effort. This principle will, no doubt, in more than one way enter in the construction of electrical apparatus in the future.

For the purpose of testing the magnetic capacity of iron Edison (67) and Eickemeyer have devised apparatus for measuring magnetic resistance. These apparatuses are constructed mainly on the same lines as the Wheatstone bridge, as employed for determining the electrical resistance of metals.

A decidedly interesting investigation, due to Prof. Schuster, and one which may go far towards explaining the phenomena of atmospheric electricity, has been carried out during the year (67). Prof. Schuster has shown, in effect, that if a current be sent through a conductor, the surrounding air is put in such condition that it will permit of the discharge of electricity between points separated at comparatively large distances from each other; and this fact is specially noticeable in rarefied gas. Nichols (68) has shown that two pieces of like magnetic metal placed within an electrolyte are capable of setting up a difference of potential when one of them is placed under the influence of a magnet, and he has called this phenomenon the electromotive force of magnetization.

Tommasi has also pointed out a very convenient method of calculating the electromotive force of voltaic batteries (69), by reference to the heats of combination of their constituent elements. We may also mention, finally, a treatise of Dr. E. Hopkinson (70) on the general theory of the dynamo, and the experiment by which it is claimed to be shown that the aurora borealis is (71) an electrical phenomenon. Attention must also be drawn to a series of instruments devised for the measurement of self induction by Professors Ayrton and Perry (72). We may finally close this résumé by calling attention to the speculation put forward by Dr. Werner Siemens (73) to the effect that through the medium of electricity the world will be supplied with food and fuel when the present stock of the latter shall have become exhausted.





FIGS. 2, 3 AND 4—SIEMENS' RING DYNAMO.

Siemens' New Ring Dynamo.

In a paper read recently before the Berlin Elektrotechnische Verein, by Herr von Hefner-Alteneck, the author referred to the statements of Prof. Forbes and Dr. Hopkinson regarding the loss of magnetism in machines as usually constructed, and showed that in the various suggestions for machines with external magnets and internal armature which have from time to time been put forward in order to avoid the dissipation of lines of force, this object is only partially attained. In most of these designs, although there is no external field, there is yet a considerable leakage of lines

between adjacent internal surfaces of the magnetic system. If the waste of field were the only consideration the best arrangement hitherto adopted would be that of M. Gramme, where the field system consists of a large circular yoke, with magnets pointing radially inwards, presenting their poles to a ring armature of the usual type. There is, however, this objection, that the machine becomes excessively heavy, and to improve the design Messrs. Siemens & Halske have reversed the relative position of armature and field by placing the latter inside and the former outside. In this way they obtained a star-shaped magnetic field, very similar to that adopted by Messrs. Ganz & Co., whilst the armature became a ring of comparatively large diameter and small radial depth, supported laterally on a casting, which was mounted on the spindle. This arrangement as applied to a belt-driven dynamo is illustrated in Figs. 2 and 3. Since the armature completely surrounds the fixed poles there is practically no waste of lines, and the close proximity of the magnet cores near the axis insures a much shorter magnetic circuit than is obtained in any dynamo of the usual type. Considerable difficulties were, however, experienced in the practical construction of this machine, and the author found that the formulæ usually employed by the makers in the design of dynamos were totally unfit in that case. One of the difficulties was sparking at the brushes. In all modern machines this has been eliminated by making the field magnets enormously heavy in comparison to the armature; but where, as in the present case, the space for the field magnets is limited and the armature is necessarily very large, it is not so easy to proportion the masses in such a way as to secure a sparkless collection. The author found that the radial depth of the ring should be very small, that only one layer of wire should be wound on the armature, and that the commutator must contain a very large number of sections. With attention to these points, and good workmanship, he has succeeded in making a serviceable machine. The armature is 25 inches internal diameter, 8 inches long, and the total weight of the machine is 1 ton 4 cwt. At 350 revolutions per minute the output was found to be 16 kilo-watts, and at 480 revolutions it rose to 25 kilo-watts. Assuming about 20 kilo-watts as a safe load for continuous working, the weight of this machine is less by one-third than that of the usual type made by Messrs. Siemens & Halske. In addition to this saving of weight the machine has the advantage of being easily repaired, since the armature is outside, and can be slipped off the shaft *in situ* without any danger of the wires chafing against the field magnets. After several of these machines had been made Messrs. Siemens & Halske proposed to utilize the design for direct driven steam dynamos. It is evident that a machine with stationary field and overhanging external armature is not suitable for small sizes, and that its greatest advantage and power of competing with existing designs will be in such cases where, on account of the motor, the speed is limited. Fig. 4 shows the arrangement adopted in connection with a pair of open direct acting steam engines; and Fig. 1 is a perspective view of the plant. The field magnets are attached to the end of the engine bed plate, and the crank shaft is prolonged so as to carry the overhanging armature. Outside the armature there is no bearing, but only the attachment for the brushes, which is secured by means of two columns, also fixed to the engine bed plate. Messrs. Siemens & Halske, according to *Industries*, have built several sizes of this dynamo, among which are four large machines for the installation at the railway station in Frankfort-on-the-Main. Each of these machines is intended for an output of 75 kilo-watts at a speed of 150 revolutions per minute.

The Next Meeting of the National Electric Light Association.

A meeting of the Executive Committee of the National Electric Light Association was held in Baltimore on Jan. 6, to make arrangements for the convention which is to be held at Pittsburgh on Feb. 21, 22 and 23. Various subjects were brought up, including patent law reform and the co-operative carbon factory, in regard to both of which it is likely that definite action will be taken. It is understood that the committee will recommend to the convention the election of Mr. S. A. Duncan, of Pittsburgh, as president for the next year. Mr. Duncan, who is in the prime of life and activity, is an old telegrapher, but has long been identified with electric lighting and is well known in the business.

We are requested by Mr. Duncan, as chairman of the Executive Committee, to state that Mr. Geo. S. Bowen, of Elgin, Ill., will make arrangements for reduced rates for the Western members to the February convention. All those desiring to attend, from the West, should communicate with Mr. Bowen at the earliest possible moment.

"Long-Winded Storage Cars."

To the Editor of The Electrical World:

SIR: If Mr. Wm. Wharton, Jr., and Mr. C. O. Mailloux, who have occupied some space in your late issues on the subject of several remarkably long runs of their respective accumulator cars, really desire to inform the public regarding the relative capacity and efficiency of their tractive systems, I beg to inform them that they have both neglected to give the only data by which such values might be computed.

It is, of course, obvious to all who have knowledge of the subject that the number of miles which one charge of storage battery can propel a motor car depends upon the weight of the car, the working efficiency of the motor—the latter being a function of its speed—and upon the current capacity and rate of discharge of the battery itself. The economy of the transformation depends, moreover, upon the rate at which the battery is charged, and varies with its size or total capacity. Again, the output of accumulators and the efficiency of motors per pound of weight varies with the type; and as this weight must be transported it should evidently be taken into account. The degree of discharge or minimum potential to which the battery is allowed to fall ought also to be stated.

To claim that an unknown charge of an unknown battery will propel an unknown car twice as many miles as another unknown battery will propel another unknown car is about as instructive as to say that a locomotive can go further than a horse.

While both of the above gentlemen are no doubt doing excellent work in the difficult field of pioneer electric traction, if they are going to talk about it will they not please say something? GEO. B. PRESCOTT, JR.

WESTON LABORATORY, NEWARK, Jan. 6, 1888.

Renewing Leclanche Porous Cups.

To the Editor of The Electrical World:

SIR: Will you be kind enough to tell us by what process or means the porous cups in the Leclanché battery can be renewed? Or can you refer us to some authority from which we can obtain a knowledge of the *modus operandi*? W. A.

ANSWER: If it is desired to recover the cup and carbon rod within the same this can be accomplished by heating the cup sufficiently to soften the pitchy substance which forms a seal for the cup. The rod can then be drawn out and the cup refilled with new depolarizing mixture and broken carbon. Care must be exercised in the heating to prevent the melting of the lead terminal attached to the carbon rod. Niaudet's "Electric Batteries," and Wormell's "Electricity in the Service of Man," give detailed descriptions of the method of making the Leclanché cell. —EDS. E. W.

Special Correspondence.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
168-177 Potter Building, New York, Jan. 9, 1888.

The Dangers of Gas.

There have been so many explosions, deaths and half suffocations from gas recently in this city that the newspaper reporters have in spite of themselves had to drop their old theme, the terrible electric light wire, and they are now discussing the dangers of gas with great vigor. The *Herald* yesterday had a column article on "Gas as a Destroying Angel." The two chief points made in the article were the prevalence of defective plumbing and the need of regular official inspection.

The Lungren System of Gas Lighting.

Speaking of gas reminds me that not a few telephone men are more or less interested in the new Lungren process of incandescence gas lighting, which seems, from all one can learn about it, to be one of the best systems of the kind. Mr. C. M. Lungren, the inventor, is a man of marked ability, and he is now contributing some articles to *Light, Heat and Power* to prove that incandescing as lighting with fuel gas is *the* thing for gas companies, being cheaper than lighting by ordinary gas or by electricity. Mr. Lungren establishes his point to his own satisfaction and with no mean ability, but I surmise that the incandescent electric light will go on as before, conquering and to conquer. In fact, the public eye has been educated up to a higher standard of light, and there is plenty of room for all good lights, electric or otherwise.

Another Rumored Electric Lighting Combination.

A report has been current in the city that an arrangement had been effected by which the Brush Company entered the existing combination with regard to the introduction of the Westinghouse alternating system. The rumor has found currency, and I therefore mention it. I may add, however, that it has been flatly contradicted by those whom it most closely affects.

The United States Electric Lighting Company

has issued a new and very handsome calendar, dedicated by permission, I believe, to Mr. Anthony Comstock. It shows a graceful figure of a woman, who is seated on a globe and holds aloft an incandescent lamp. Beneath is the calendar in the form of detachable sheets.

McIntosh-Seymour Engines.

In your last issue mention was made of the vogue already enjoyed by the McIntosh, Seymour & Co.'s engines, made at Auburn, N. Y. Two of these engines have been running at the general offices and at the stables of the American Express Company. They have given such satisfaction that the express company has duplicated them (as well as the Edison plant) for its new building in Boston.

K. K. Wire.

Holmes, Booth & Haydens are calling special attention to their well-known K. K. insulated wire, and I have before me now a very neat sample card of their No. 6 B. & S. gauge of this wire for electric light line work.

The Advance in Copper Wire.

Perhaps to illustrate the advance in the price of copper I cannot do better, if you will allow me, than to make note here of the current quotations of Holmes, Booth & Haydens. I may say that these figures are liable to change at any moment:

Underwriters' Copper Electric Light Line Wire.

Nos.	0000 to 0,	B. & S.	gauge,	27	cts. per lb.
"	1 to 4,	"	"	27	" "
"	5 and 6,	"	"	27	" "
"	7 and 8,	"	"	27	" "
"	9 and 10,	"	"	28	" "
"	11 and 12,	"	"	29	" "
"	13 and 14,	"	"	30	" "
"	15 and 16,	"	"	32	" "
"	17 and 18,	"	"	33	" "
"	19 and 20,	"	"	34	" "

Magnet Wire.

				Single wound. Cents per lb.	Double wound. Cents per lb.
Nos.	0000 to 0,	B. & S.	gauge.....	32	34
"	1 to 4,	"	"	30	33
"	5 and 6,	"	"	32	34
"	7 and 8,	"	"	33	35
"	9 and 10,	"	"	34	36
"	11 and 12,	"	"	35	37
"	13 and 14,	"	"	36	39
"	15 and 16,	"	"	37	40
"	17 and 18,	"	"	38	42
No.	19.....		.....	39	43

Hine & Robertson.

Messrs. Hine & Robertson, 45 Cortlandt street, New York, manufacturers and sole agents for "Eureka" packing, which they guarantee the best in the market, are offering a special inducement to engineers of electric light plants to try the packing, as they believe that once "Eureka" is used its superiority will be recognized. They are presenting to engineers who order 15 lbs. of this packing a first-class 8-day calendar clock, 12-inch dial, 22½ inches high, of the best make, or a set of handsome "Paragon" oilers, largest size, tray 13 by 16 inches in diameter. Either of these presents is an ornament as well as a useful and valuable adjunct to an engine room.

Phœnix Glass Company.

Mr. E. H. Fox, 729 Broadway, issues the following in behalf of the Phœnix Glass Company: "Not having called upon some of our customers during the last season, I would explain by stating that, because of our having been favored with orders far beyond our capacity to fill in a reasonable time, I was called home early in September. Our factory has enlarged several departments to meet the increasing demand, and I trust, during 1888, to visit our customers with the same regularity as heretofore. For the season of 1888 new lines of rare excellence will be presented in gas, kerosene and electric globes and shades and tableware, including rich cut glassware of the finest quality."

The C. & C. Electric Motor Company.

A pamphlet in which no words are wasted has just been issued by the C. & C. Electric Motor Company, of this city. It contains a number of excellent illustration of their batteries and motors, and of the effective combinations which can be made of the motor and pumps, fans, ventilators, etc. At the foot of each cut are a few lines giving pithily the details of interest and value about each object.

Equable Temperature.

The system of the Metropolitan Electric Service Company, 120 Broadway, for maintaining an even temperature, continues to grow in public favor. I have from time to time made note of the various large installations of the service. The list is still growing and at a very rapid rate, and the appearance is that soon no first-class residence will be considered complete without its heat regulating apparatus of this character. Among recent patrons are such well-known men as Sidney Dillon, D. B. Fayerweather, M. B. Cary and T. Schumacher.

Miscellaneous.

Chas. A. Schieren & Co. report sales of leather link belting to the following concerns for use on dynamos: Plainfield Electric Light Company, Plainfield, N. J.; Edison Electric Ill. Company, New Orleans, La.; Peoples' Electric Light Company, Trenton, N. J.; Pennsylvania Pulp & Paper Company, Lock Haven, Pa.; Edison Machine Works, Schenectady, N. Y.

I understand that Judge Cox, in the U. S. Circuit Court, has rendered a decision in favor of the heirs and assigns of H. L. Roosevelt against the Law Battery Company, with respect to the attachment of two or more conglomerate plates to a central plate or carbon.

The Tucker Electrical Manufacturing Company exhibited at the recent electrical exhibition a fire door released by an electrical thermostat. It has now received an order for 28 of these doors for the Nairn Linoleum Works, at Newark. Such doors ought to be in every factory. The Tucker Company has also just installed a Mather incandescent plant for the Ondawa Paper Company, Middle Falls, N. Y.

One by one well-known telegraph men become connected with the newer developments of electricity. Mr. E. A. Leslie, lately so prominent in the Baltimore & Ohio Company, has joined the management of the New York Isolated Accumulator Company, which has also secured the services of Mr. A. H. Bauer, an old telegrapher, and a pioneer and expert in the storage battery field.

The New York Insulated Wire Company, through Mr. J. W. Godfrey, reports a rushing business. It has lately received and filled orders for its wire for the Capitol at Washington, for the Post-Office at Philadelphia, for Levi P. Morton's residence at Rhinecliff, N. Y., and for the American Express stables in this city. W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
48 Congress Street, Boston, Jan. 9, 1888.

The Electric Light Under Water.

From Winchendon, Mass., comes the report of a drowned boy's body having been recovered by putting an electric light on the end of a pole and moving it about under the water.

Torpedo Work at Newport.

Advices from Newport, R. I., state that the new class has reported for advanced instructions in torpedo service at the torpedo station. The class consists of Lieuts. R. Henderson, J. N

Bonyer, Cameron M. R. Winslow and Ensign John A. Doherty The course lasts till May. Electrical experiments in the use of torpedoes will form an important feature in the instruction.

Waterville, Me.

The Waterville, Me., Electric Light Company has received its new wheel, and a force of men is now engaged in putting it in place. The wheel is a 54-inch, latest improved Risdon wheel, which under the head of water at this point will give 125-horse power. The weight of the wheel and pulley, including jack shaft, is nearly ten tons.

The American Plant for Hyde Park, Mass.

A prominent resident of Hyde Park, Mass., stated to me yesterday that the American Electric Manufacturing Company is making rapid progress in that city in setting poles and stringing wires for lighting the streets with arc lights. My informant is of the opinion that the electric lights will be burning on the streets of Hyde Park by the middle of the present week. The citizens of the neighboring towns of Canton and Stoughton are agitating the question of having electric lights.

Lighting Sleighs by Electricity.

From the Boston *Evening Transcript* I clip the following: "At the recent Mechanics' Fair one exhibitor had carriages with incandescent electric lights in the lamps. Several Newton gentlemen have made arrangements to use this form of illumination for their sleighs and carriages. Three cells of battery are to be used, and will furnish three lights of six-candle power for thirty hours. After the electricity is exhausted the batteries are taken to a dynamo in the stable of one of the gentlemen and recharged. The expense of this charging cannot be over fifty cents each time. The "plant" is a small one, and can be taken out and placed in any kind of a vehicle. It can be doubled, so that a gentleman can surround himself in a blaze of light if he wishes. A procession of these electrically-illuminated sleighs, when colored glasses are used, would make a grand spectacle upon the white snow, and an electric-light sleighing carnival on the mile ground is not beyond the probabilities of the winter." Mr. J. T. Moriarty, representing the Electrical Accumulator Company, has the matter in hand.

The Rogers Fire Alarm.

The Boston Auxiliary Fire Alarm Company, operating under the Rogers patent, branch of the Alarm Box Controller Company, of Providence, R. I., has recently installed its boxes and apparatus throughout two more of Boston's popular hotels, *i. e.*, "Young's" and Sherman House. It will be remembered by readers of this letter that the Parker House, Boston, was undoubtedly saved from a disastrous conflagration a month or so ago by the use of the "Auxiliary" system referred to.

The Seymour Manufacturing Company.

The works of the Seymour Manufacturing Company, of Seymour, Conn., which were partially burned Monday night, will at once be rebuilt. The tubing and copper rolling department were not much injured. It is expected to have a new building up within sixty days. The loss was $60,000 and insurance $30,000, but only $10,000 on the machinery, on which the actual loss was heaviest.

New England Insurance Exchange.

At the annual meeting of the New England Insurance Exchange, held at its rooms in the Mason building, Boston, Saturday, Jan. 7, the following officers were elected for the ensuing year: President, Henry R. Turner; Vice-Presidents, H. S. Wheelock, E B. Cowles and Frank A. Colley; Executive Committee, Amos Sherman, Chairman; James H. Leighton, B. R. Stillman, F. A. Wetherbee and S. J. Whyte.

The Edison Plant at Brockton.

The practical and financial results attained by the Edison Illuminating Company, of Brockton, Mass., since the reorganization of the station and the consolidation with the arc lighting interests, show most fully the wisdom of the steps taken in the early Summer to that end. At that time the Engineering Department of the Edison Electric Light Company in New York, under charge of Mr. J. H. Vail, the General Superintendent, undertook the remodelling of the station to conform to the standard of Edison plants since the above department was created. Complete plans were prepared and the difficult matter of making the extensive changes and additions without interfering with the running of the plant, was successfully accomplished. At the same time a consolidation with the arc lighting company was effected and their plant moved to the same station and brought under one management with large reduction of expenses. The results are now shown in one of the finest stations in New England, running smoothly and economically, and with monthly net receipts in excess of anticipation, insuring a paying basis beyond what was calculated or expected. These results make an example which others might well consider, and prove the wisdom of the parent Edison Company in having a competent department to originate and carry out the proper changes where a plant has not been properly constructed and managed.

The Hartford Dynamic Company,

of which Prof. C. K. Wead is president and Mr. H. M. Linnell general manager, has issued a calendar of somewhat original design. It is to all intents a memorandum pad, serving the purposes of a calendar, and thus affords at once a record of the work accomplished as well as a reminder of the duties and engagements that are to be discharged. The pages are held down by a rubber band, and are turned every two weeks.

Street Railway Projects.

The Boston *Evening Transcript*, of recent date, comments on street railway projects as follows:

"The Meigs Company asks for an amendment to its charter relating to capital stock, location and termini: Thomas J. Mayall asks for authority, after incorporation under the general law and with consent of the municipal authorities, to construct elevated roads in Boston and its vicinity, the motive power to be cables, electricity or pneumatic tubes; Frank A. Bartholomew and others ask to be incorporated as the Boston Elevated Railway Company on the Riley system, and S. B. Hinckley and others propose to build an elevated line connecting the northern and southern stations in Boston and running to South Boston, Roxbury and Lynn. The East Middlesex Street Railway Company wishes to extend its road to Wakefield and increase its capital stock $500,000; the Onset Street Railway Company petitions for amendment to charter, and incorporation is asked for the Marlborough Street Railway Company."

The Proposed Pacific Cable.

A special dispatch from Ottawa, Ontario, to the Boston *Herald*, under date of Dec. 27, read as follows: Your correspondent learned at the Department of Marine and Fisheries to-day that, owing to some misunderstanding between the Dominion and Australian governments, the departure of the Dominion government steamer "Alert," which was to have left Halifax this month for the Pacific, to make a survey from British Columbia to Australia, for the proposed cable, has been indefinitely postponed. The two governments were to carry on the survey jointly, the Dominion government to furnish the steamer and Australia to defray expenses. Every arrangement had been made for the "Alert's" departure, and the delay has caused much disappointment to the projectors. The cable was to form part of the Fleming system, by which he proposed to connect British Columbia, Australia and India, and in which he has been promised the support of all the governments concerned.

Personals.

Mr. P. H. Alexander, of the Sawyer-Man Electric Company, owing to poor health caused by too close attention to business, has decided to spend a few weeks' vacation in the Southern States.

Mr. A. B. Griggs, of the American Electric Manufacturing Company, reports the recent installation, under his supervision, of an arc-light plant of the American system at the mills of the Amoskeag Manufacturing Company, Manchester, N. H.

Mr. Alexander P. Wright, the recently appointed manager of the Springfield, Mass., Electric Light Company, has not only become settled in his new field of labor, but has already increased the company's patrons for both arc and incandescent lights; and added to the number of power customers, as well. W. I. B.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
39 South Tenth Street, Philadelphia, Pa., Jan. 9, 1887.

The Electric Light Contracts.

As already noted by you, the electric light companies are lighting their respective districts for the current quarter at the prices contained in their recent bids, each for its own of the seven districts they covered.

The Keystone Company's Detectives.

City Councils' Electrical Committee again dashed the hopes of the Keystone Light and Power Company last Thursday by postponing its ordinance because of the publication of the fact that it had employed detectives to shadow Councilmen in order to secure information about their actions. The committee agreed to report favorably the ordinance granting privileges to the Edison Electric Light Company, and then took up the report of a sub-committee on the Keystone Company's ordinance. Mr. Rudderow, counsel of the Keystone Company, denied the story, but admitted that they had used detectives to investigate the affairs of the Penn Electric Light Company, a rival concern. The *Record* still insists on the truth of the story, and there may yet be an interesting investigation.

Telephone Subways.

For over two hours the lawyers of Councils and John Bardsley debated the bill granting permission to the Bell Telephone Company to lay underground conduits and wires under about twenty-three miles of the streets of the city. The bill had been previously passed by the Select Council, and the company has a reserve fund of $200,000 for the work, which must be completed within five years. The chamber was evidently a unit in favor of putting the wires underground, and the main question was raised on the point whether the company should pay a tax of three per cent. on its gross earnings for the privileges granted. Some of the lawyers thought it should; others of the lawyers, together with Mr. Bardsley, thought it should not. The laymen of the chamber, with the exception of John Bardsley, had nothing to say upon the subject. When the vote came to be taken upon the question of taxation the voices in the negative were so greatly in the majority that the yeas and nays were not called for, and upon final passage there were but four votes recorded against the bill.

Private Plant of Strawbridge & Clothier.

Strawbridge & Clothier, at Eighth and Market streets, have the most complete private electric light plant in this city. The cost of the plant and building amounted to $120,000. The factory is in the basement of the new building, on Filbert street, opposite the store. For supplying the power there are two 100 h. p. Ball high speed engines, two 80 h. p. high speed engines and one 60 h. p. high speed engine. There are 2,400 lights in the building, supplied from eight dynamos. Two dynamos of the Westinghouse alternating pattern supply 1,500 incandescent lamps. The boilers are four in number, of the Hoffman-Fontaine style. They are each 18 feet long, 66 inches in diameter and have 47 four and a half inch tubes. Leading from the factory to the store are 18 lead-covered cables, which are carried underground. In the store the lamps are in alternate circuits, so that in case anything should happen to one circuit the store would not be left in darkness. To connect the lights about eight miles of insulated wire are used.

New Companies.

Charters were granted at Harrisburg this week for the National Electric Railway Company, of Pittsburgh, with a capital stock of $100,000, and to the Bennett Electric Light Company, of Millvale, Allegheny County, with a capital stock of $1,000. E.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
44 Lakeside Building, Chicago, Jan. 7, 1888.

Anti-Telephone Agitation.

The Chicago *Tribune* has devoted a column or two upon its first page every issue for the past week to replies it has received in answer to a circular regarding the telephone service. The *Tribune* has evidently declared war against the telephone company. The question of wages paid the operators has also been prominently mentioned. Perhaps a free telephone here and there would stop this agitation.

Street Lighting by the Westinghouse System.

The Mayor has stated that he would favor the adoption of the Westinghouse system for street lighting were it not that the streets would have to be torn up again.

Fuel Gas for Chicago.

Messrs. Westinghouse, Bannister and Pantaleoni, representing the Westinghouse-Sargent Company of Pittsburgh, were in consultation with the city authorities for several days, explaining the method in use by their company for supplying fuel gas with the view of organizing a local company, provided a franchise is secured. They propose to manufacture this gas from the soft coal which is found in inexhaustible quantities in Illinois and Indiana, within short distances from this city, and at a cost to consumers of from 35 to 50 cents per thousand. They propose to lay their mains at first along the less traveled streets and through alleys, and whenever it is necessary to cross paved streets their plan is to tunnel underneath the paving.

The Hauss Electric Manufacturing Company.

Mr. D. J. Hauss, president of the Hauss Electric Manufacturing Company, of Cincinnati, called at the office of THE ELECTRICAL WORLD this week. I learn from Mr. Hauss that his company is operating a 2,500 light incandescent long-distance system in Chattanooga, Tenn., while in Cincinnati several thousand lights are already in circuit, and the demand is so great from this plant and from other customers that Mr. Hauss has just completed the organization of a corporation with $250,000 capital stock, in order to take care of his orders. A seven-story building is now in progress, designed to meet these wants. This system is already well known in the South, from which section the orders have been received so fast that, with his former facilities, promptness in filling orders could not be guaranteed. As soon as the new factory is running Mr. Hauss stated that he proposed to introduce his system in every large city in the United States.

The "Hauss system" is known as the "nickel-plate," from the fact that wherever nickel plate can be used instead of the bare brass it is done.

Telephone Quotations.

Col. S. G. Lynch, broker, 146 La Salle street, furnishes me the following quotations upon telephone stock:

Bell of Mo.	$160@	$165	Iowa Union	$28@	$30
Central Union	44@	45	Michigan	75@	76
Chicago	375@	390	Missouri and Kansas	68@	69
Colorado	19@	21	Rocky Mountain Bell	40@	45
Cumberland	62@	65	Wisconsin	108@	109
Great Southern	30@	32			

C. H. M.

NORTHWESTERN NOTES.

ST. CLOUD, Minn., Jan. 3, 1888.

The St. Cloud Gas and Electric Company was organized on Dec. 22, 1887, with a paid up capital of $100,000. It at once purchased the gas plant and all the property and franchises of the St. Cloud Gas and Electric Light Company and the plant and franchise of the St. Cloud Electric Light and Power Company, which was using the United States system, with about 150 lamps of 16 candle-power. The new company has now put in a complete new plant of the Thomson-Houston and Westinghouse systems It has purchased a lot and rented water-power from the St. Cloud Water-Power and Mill Company at a cost of $5,000 for the lot and $10 per year for each horse-power, taking its power through the dam direct from the Mississippi River by means of a penstock. Its arc machine has a capacity of 45 2,000 candle-power lights, and its incandescent—alternating—of 650 16 candle-power lights. The latter was started on Jan. 1 with over 500 lights in service, and the arc machine will be started up about Jan. 10 to light the city, a place of about 7,000, the railroad shops, etc. Next season the company will enlarge both its gas and electric light plants. It has an exclusive franchise for twelve years, and has already a good business in both gas and electricity. The town has lately been selected as the location for the general car manufacturing shops of the St. Paul, Minneapolis & Manitoba system of roads, four of which converge here. A dam across the Mississippi River, costing $225,000, has recently been completed, giving next to the well known Falls of St. Anthony at Minneapolis the largest water-power in the State. St. Cloud is on the St. Paul Division of the Northern Pacific Railroad, and has a direct line to Duluth and the great lakes. With these advantages it is rapidly becoming a manufacturing city of importance. R. A. E.

PACIFIC SLOPE NOTES.

SAN FRANCISCO, Cal., Dec. 22, 1887.

An American electric light plant was started on the 21st inst. at Santa Clara by the Electric Improvement Company, of San Francisco.

The San Jose and Santa Clara electric road has been delayed in going into operation, and will not start up before New Year's Day, although a much earlier date had been fixed. The trouble occurs through the tardiness in the arrival of the dynamos and of the cars from the Pullman Company.

Oakland now has two electric lighting companies, and a third is after a franchise from the city.

Claus Spreckels, who has so much "sugar" of both kinds, is about to build a large beet sugar refinery at Watsonville, Cal., and will light it with incandescent lamps.

OAKLAND, Cal., Dec. 19, 1887.

The Oakland Electric Light and Motor Company has just been organized, with James Gamble, formerly General Manager of the Western Union Telegraph Company, Pacific Division, as President, and W. W. Blaw, Secretary. The capital stock is $200,000. The new company has purchased the plant of the Pacific Coast Electrical Construction Company, which had already built up quite a large business, having about 160 arc lights in operation. It is the intention of the new company to extend the business largely by adding the incandescent system as well as the use of electric motors for running street cars and machinery. The company will be confined to no special patents, but intend to secure the best that can be had, so as to make the system as perfect as possible.

The dynamos and lamps at present used by the company are the Weise patents, and, so far, are giving satisfaction.

Oakland is growing very fast, and the company will be compelled at once to double the capacity of the station as far as en

gines and boilers are concerned. The works are located in a central part of the city, in a large, new, brick building, and the plant, in all respects, is one of the best in the State. R.

ENGLISH NOTES.

LONDON, Dec. 27, 1887.

Electric Lighting at Bradford.

The resolution arrived at by the corporation of Bradford to undertake the supply of electric light to private houses in a certain district of that city, is an event of no small importance in the history of electric lighting in this country, and it loses none of its significance when it is understood that some years ago the corporation laid out a large sum in order to acquire the existing gas works. When in 1881 a mushroom company applied for parliamentary powers to undertake the electric lighting of Bradford, the corporation sent a deputation to the metropolis to oppose the application and at the same time to ask for powers to undertake the duty on their own account. In accordance with the policy which actuated the Board of Works at that period, the company was refused the order, which was granted to the corporation. The same result followed in numerous instances similar applications to the Board of Trade at the period in question, the consequence being that Bradford is by no means the only English town where the corporation possesses the exclusive right to supply electricity. But hitherto the Bradford corporation is the only one which has been awakened to a sense of the fact that the acquisition of this privilege virtually carries with it the responsibility to undertake the duty in question. It is certainly not too much to say that as soon as ever the progress of affairs had rendered it possible to do so with due regard to the interests of the ratepayers, that period has already arrived. It is, however, much to be wished that our American friends would bear in mind that until the cost of electricity has been reduced to a far lower price than it can at present be supplied for, even with the aid of transformer distribution, it will always be necessary to regard electric lighting in this country as a luxury pure and simple. At Bradford, for instance, the cost of gas is two shillings and two pence per thousand cubic feet, and it is the avowed intention of the corporation to endeavor to supply electricity at the rate of 5d. per kilo-watt, which may roughly be taken as equivalent to just double the present price of gas. It would be interesting to English readers to learn if there is any instance in the United States where electricity is successfully competing with gas under these or similar conditions. That is to say, where gas is sold in the same town at a rate equivalent to half that charged for electricity. However, notwithstanding the disproportion in the price, there seems to be every reason to believe that with judicious management and a proper selection of methods, the Bradford central lighting station will have a prosperous future. The only room for doubt—but this is a serious one—is whether a rate of 5d. can be made to pay. At Brighton the cost of producing electricity for distribution upon the constant current system amounts to 9.313 d. per kilo-watt. It is true that the dynamo machines at Brighton are of old-fashioned type, but in every other respect the station is in as good a position to produce current at a low price as can be found in this country, at any rate.

The Bradford corporation have so far dealt with the matter from a common sense and business-like point of view. They have declined a proposal that was made to them by a local firm, which had already started a small central lighting station on its own account; the reason assigned being that the station is not very conveniently situated; that there is little or no room for permanent extensions, and that the price asked for the plant and machinery as a going concern was nearly double what the corporation are at present inclined to spend. In point of fact, the outlay is at first to be of a strictly limited character, and although the corporation is making provisions to allot a sum of £15,000 to this work, it is not at present their intention to spend more than £8,000 or £10,000. As yet no contract has been made and no decision arived at as to the introduction of any particular system. A preference has been expressed for a low tension system, and in all probability the corporation could not do better than to expend its first outlay in this particular direction so as to light the district immediately adjacent to their station, and to gain some general experience of the matter. But it would, of course, be absurd to attempt to light a town of the size of Bradford entirely by means of a low tension system, and it may practically be taken for granted that if the thing is done at all, transformers will be called into the service.

The Brighton Central Station.

Turning now from what is going to be done at Bradford, to what has been done at Brighton, of which your contemporary here, the *Electrician*, is now giving a very full and detailed description, I am in a position to add some information on one point which has not yet been made public. That is as to the financial details. Some remarkably careful tests have been made at Brighton extending over a considerable space of time, in order to determine accurately what is the actual distribution of the total charges per unit supplied. The coal has been weighed, the water has been measured, a careful record of oil and waste has been kept, and the whole outlay of all kinds is included in the subjoined table:

COST OF ONE KILO-WATT AT BRIGHTON.

	Pence.	Percentages.
Wages	2.580	27.7
Coal	2.180	23.4
Water	.192	2.06
Oil and waste	.290	3.11
Carbons	.338	3.63
Office expenses	.581	6.33
Salaries	1.260	13.53
Rent and taxes	.725	7.78
Repairs	.287	3.08
Petty disbursements	.080	.86
Depreciation	.800	8.59
	9.313	100.00

Possibly the most interesting fact which is brought out in this table, is that the expenditure for fuel and water amounts to only 25 per cent. of the total. From this it would certainly appear that any considerable extension of the plant would result in a perceptible reduction of the cost of the unit. It is also interesting to know that the total efficiency obtained from the indicated horse-power of the engine down to the watts upon the terminals of the dynamo does not exceed 41 per cent. Mr. Wright, the electrician in charge, is strongly impressed with the fact that durability of the machine and ease and cheapness of repairs are really of considerably greater importance than a very high commercial efficiency, and this view seems to be fully borne out by the above figures. For instance, an increase of 10 per cent. in the efficiency of the machine means a reduction of only about 2.5 per cent. in the cost of a unit; while any decrease in the cost of repairs, or the allowance for depreciation, tells directly to its full extent.

THE TELEGRAPH.

Martha's Vineyard Cable.—General Greely, Chief of the Signal Service, has asked for an appropriation of $2,000 for furnishing, delivering and laying seven nautical miles of submarine cable for Martha's Vineyard. The present cable, lying in a bad position, has been broken three times and otherwise damaged since 1885.

A Telegraph Instructor Shot.—M. Victor Mimault, a telegrapher, fired six shots from a revolver at M. Regnault, the director of the School of Telegraphy, in Paris, on Jan. 4, two of which took effect, and inflicted severe wounds. Mimault was actuated by a desire to redress personal wrongs connected with some patent case. He was arrested.

Commercial Cable Mottoes.—The N. Y. *Herald* publishes these as sentiments for 1888: General Manager Ward, of the Commercial Cable Company—Our motto for 1888 is "Prudence, Unity, Backbone." Vice-President De Castro—I am resolved to do even more than ever to preserve, and, if possible, increase the enthusiasm and fidelity of our cable forces.

Another Postal Scheme.—Senator Cullom will introduce an amendment to his Postal Telegraph bill immediately after Congress shall have reassembled, changing the rates proposed in the original bill. The rates to be named in his amendment are based upon a unit of 100 words or fraction thereof, and are as follows: For 500 miles or less, 25 cents; between 500 and 1,000 miles, 30 cents; between 1,000 and 1,500 miles, 35 cents; between 1,500 and 2,000 miles, 40 cents; between 2,000 and 3,000 miles, 45 cents; and for more than 3,000 miles, 50 cents. When more than one copy of the same dispatch shall be sent to different newspapers at the same or at different offices the Postmaster-General will prescribe the rates to be charged for the "drop" copy.

The Bankers and Merchants Enjoined.—The Boston Safe Deposit and Transit Company filed last week in this city a complaint against the Bankers and Merchants and United Lines Telegraph Companies in the United States Circuit Court for removing wires from poles. The Boston Safe Deposit and Transit Company as trustee holds certain stock of the American Rapid Telegraph Company, and the complainant alleges that the defendant companies are removing the wires of the American Rapid Company, which had been stretched upon the Bankers and Merchants' poles between Port Chester and Albany, and Albany and Boston. Judge Lacombe granted a temporary order restraining the Bankers and Merchants from transferring the wires.

Telegraphs in Baltimore.—For the first time in nearly 20 years the telegraph offices on the floor of the Corn and Flour Exchange at Baltimore were closed on Jan. 3. For some time past the Western Union Company has paid the rent of its own office as well as that occupied by the late Baltimore and Ohio Telegraph Company, but declined to pay for both after the close of the year. The Executive Committee of the Exchange insisted that the rent of both offices—$1,500—should be paid for the current year, which the Western Union Company declined to accede to, and removed the wires from the building. Much inconvenience was experienced by the members, who were obliged to send out their messages for transmission, and there was some complaint. The members are divided in regard to the action of the Executive Committee, and state that they will be obliged to yield, as the telegraph cannot be dispensed with.

The Anderson Bill.—Mr. Anderson, of Kansas, has reintroduced in the House of Representatives the Postal Telegraph bill introduced by him last session, authorizing the Postmaster-General to construct and operate a general system of postal telegraphy. The provision for the issue of bonds to defray the cost of establishing the telegraph is omitted, and in its place a new section is inserted appropriating $10,000,000 for that purpose. He also reintroduced his bill amending the Railroad and Telegraph act so as to secure the free use of the telegraph lines by all companies and persons on equal terms, and forbidding the collection and sale of news by telegraph companies. Mr. Weaver, of Iowa, also introduced his bill of last session establishing a postal telegraph, authorizing the construction of lines in all parts of the country, creating the office of Fourth Assistant Postmaster General, to administer the telegraph and fix the tariff, and providing for the acquisition of the right of way for the lines. Mr. Rogers' bill to secure cheaper telegraphic correspondence makes all post-offices telegraphic stations, fixes the tolls, adapts the money-order system to the postal telegraph, and authorizes the Postmaster-General to contract with private companies for the supply of suitable telegraph lines.

The Chicago Postal Company.—A special dispatch from Chicago of Jan. 9 says: The Chicago Postal Telegraph Company, an Illinois corporation which obtained a charter a month ago at Springfield, has, it is announced to-day, notified the Federal authorities at Washington of its acceptance of the conditions of the law in relation to telegraph companies passed July 24, 1886. By the terms of the law the company, in consideration of allowing government dispatches priority over all others, and sending them at a rate to be fixed by the Postmaster-General, is permitted to build and operate lines along any post road; in other words, any railroad over which United States mail is carried. The company will co-operate with the Mackey-Bennett system, and has selected a route from Chicago through Milwaukee, Green Bay, Marquette, to Duluth, where it connects with the Mackey-Bennett, which comes to Chicago via Minneapolis and St. Paul. A branch through Michigan from Marquette has been projected, its construction to be followed by the building of lines west of Illinois and Iowa and thence west to San Francisco via the Union Pacific. The company is entitled by the law of 1866 to receive 40 acres of public land for every 15 miles of telegraph constructed. The treasurer of the company is a well-known Chicago man, Secretary Miller of the United States Distilling Company, of which he is part owner.

THE TELEPHONE.

Telephone Wires in Germany.—It is said that the German government will spend $750,000 in putting its overhead telephone wires underground.

The Legislative Committee Report.—It is said in the papers that the report of the New York legislative committee which conducted the recent telephone investigation will be far more moderate than is usual in such cases, and will show, what is the fact, that though in one or two cases earnings may be large, the average rates are fair.

Brattleboro, Vt.—The telephone exchange at Brattleboro begins the new year with an improved Standard switch-board accommodating 100 lines. The company, which, by the way, is one of the few in its section not controlled by the New England syndicate, has its whole plant in excellent condition, and has more subscribers than ever. F. W. Childs & Co. are the managers.

The Chicago Changes.—Speaking of the recent changes in Chicago by which Mr. B. E. Sunny succeeds Mr. Fay as president of the Chicago Arc Light Company, Gen. Barney, in his telephone bulletin, says: "The members of this association will learn with regret that our worthy ex-president, Mr. C. N. Fay, has withdrawn, in a measure, from the telephonic field, having resigned his position as general manager of the telephone company in Chicago; but while mourning the loss to the fraternity, they will most heartily congratulate Mr. Fay, personally, upon his election as president of the new Gas Trust, in that city, with a reported salary of $20,000 per annum."

A Telephone Company's Obligations.—At Lafayette, Ind., on Jan. 3, Judge Vinton, sitting in the Circuit Court, decided that telephone companies doing a general telephone business are compelled by the statute to furnish instruments at the legal rate of $3 a month whether they wish to do so or not. The case came up on an application of the Folley Hardware Company for a writ of mandate requiring the Central Union Telephone Company to place an instrument in its building at $3 a month. The court held good the demurrers to the company's answers, and decided that under the statutes the company was bound to furnish every applicant with a complete outfit of instruments and connections. The company endeavored to show that it was not furnishing private wires or private telephones, but that it established public stations throughout the city, at which each person, upon the payment of 5 cents, could be placed in communication with all portions of the system. The court held that the company was engaged in a general telephone business and was bound to furnish all persons applying for service with telephones and telephonic connections and facilities at their place of business or store room for the sum of $3 a month. The company will appeal.

"Toy Telephones."—Two amusing stipulations were filed in the United States Circuit Court yesterday by the defendants in the case of the American Bell Telephone Company against A. S. Aloe and others. Last August the Bell Telephone Company commenced a legal war on all parties having in their possession, making, selling, buying or using electrical apparatus similar to those made and used by that company, and for which it had letters patent. In answer to the charge Mr. Aloe said he acknowledged the letters patent and had made no attempt to infringe. While in Paris a few years ago he bought three toy telephones, which he afterwards used in his store. He sold a set of them to a party unknown to him, not knowing that the same was an infringement. He destroyed his set of toy telephones as soon as he heard he was infringing, and promises not to make or sell any more. He asks that the case be dismissed at his cost. As to William Grady, his chief clerk, charged with him in the case, he says he reprimanded him and told him not to abuse his position. Mr. William Grady, the "et al," in the case, says he admits the validity of the patents and did not use any other than the Pan telephone, and he promises not to use, make, sell, buy or procure any telephone but the Bell. This statement, he concludes, is made voluntarily, at the request of the Bell Telephone Company.—*St. Louis Republican.*

THE ELECTRIC LIGHT.

De Funiak, Fla., is to have an electric light plant.

Anna, Ill.—The Edison plant at Anna will comprise 225 lights.

Pottstown, Pa., is to have an electric light plant. Mr. H. Wells is interested.

Troy, Ala., is to have an electric light plant in which Mr. J. M. Henry is interested.

Birmingham, Ala.—An electric light plant is being put in the Alabama Rolling Mills.

Macon, Mo.—The new Macon Gas and Electric Light Company has a capital of $24,000.

Guilford, Me.—The Piscataquis Woolen Company proposes to put in an electric light plant.

Carlisle, Pa.—A plant is to be put in at Carlisle. Mr. C. F. Shower is among those interested.

Windsor Locks, Conn.—C. H. Dexter & Sons are to construct a plant at Windsor Locks for their mill.

New Albany, Ind.—The Citizen's Electric Light Company will proceed at once, it is said, to erect its plant.

Detroit, Mich.—The local Brush Company has made a new contract with the city for lighting for three years.

Danielsonville, Conn.—E. H. Jacobs & Co. have it in contemplation to put an electric light plant in their mill.

Waxahachie, Tex.—The Waxahachie Electric Light, Power

and Water Company, which has a capital stock of $50,000, is to put in a plant of 15 arcs and 250 incandescents.

Schenectady, N. Y.—The new blacksmithy of the Schenectady Locomotive Works is to be lit by 840 incandescents.

Napa, Cal.—The Napa Electric Light Company, incorporated by J. O. Hirschfelder and others, has a capital stock of $50,000.

Chicago.—Nine 125 h. p. Buckeye engines will drive the dynamos in the new city electric lighting plant for the Chicago River.

Amsterdam, N. Y.—The Amsterdam Arc Light Company, organized by J. E. Vocrhees and others, has a capital stock of $15,000.

Valparaiso, Ind.—The Valparaiso Gas, Electric Light and Fuel Company, recently incorporated, has a capital stock of $50,000.

Morristown, Tenn.—The Morristown Electric Light Company will use the Thomson-Houston system. It has a five years' franchise.

Chattanooga, Tenn.—It is rumored that the Brush Electric Light Company will move their plant to another location and enlarge it.

Seneca Falls, N. Y.—The Seneca Electric Light Company has been incorporated by S. L. Phillips and others with a capital stock of $60,000.

Richford, Vt.—A stock company has been formed at Richford to operate there the Thomson-Houston plant, which has given great satisfaction.

Seward, Neb.—Mr. J. Cattle and others are the incorporators of the Seward Electric Light and Power Company, with a capital stock of $10,000.

York, Neb.—The New York Gas and Electric Light Company, incorporated by D. E. Sedgwick, M. Sovereign and others, has a capital stock of $8,000.

Mahanoy City, Pa.—The Mahanoy City Light, Heat and Power Company has been incorporated by W. L. Yowder and others with a capital stock of $15,000.

Conshohocken, Pa.—The Conshohocken Electric Light and Power Company has been incorporated by T. H. Seeble and others with a capital stock of $20,000.

Cincinnati, O.—The Hauss Electric Manufacturing Company of Cincinnati has been incorporated by D. J. Hauss and others with a capital stock of $250,000.

Helena, Ark.—Mr. J. H. Andrews, representing the Van Depoele Electric Manufacturing Company, of Chicago, Ill., has formed a $25,000 stock company, at Helena, to erect a plant.

Kansas City, Mo.—The Hallett Electrical Illuminating and Power Company, of Kansas City, has been formed by J. M. Hallett, A. L. Ellis and others, with a capital stock of $60,000.

Strong City, Kan.—The Union City Electric Light, Gas and Water-Works Company, of Strong City, has been incorporated by W. P. Martin and others with a capital stock of $10,000.

In a Japanese Bazaar.—The electric light is apparently a great attraction to the Japanese. It has been introduced in the Osaka bazaar, which has in consequence received a great increase of visitors.

Gas and Electricity at Brattleboro, Vt.—The Thomson-Houston plant at Brattleboro has been purchased by a number of business men, who also own the gas plant. Possession was taken on January 1.

Mount Vernon, N. Y.—The board of village trustees of Mount Vernon have confirmed the contract with the American Electric Light Company to supply the village with thirty electric lights at $100 per light.

Friction Clutch Pulleys.—The Eclipse Wind Engine Company, of Beloit, Wis., has recently furnished its friction clutch pulleys to the Brush companies at Detroit and Cincinnati, and the Chicago Arc Light Company.

Dallas, Tex.—The Electric Light, Power and Manufacturing Company, lately chartered with a capital stock of $50,000, have purchased the plant of the Texas Electric Light and Manufacturing Company and will enlarge it.

San Rafael, Cal.—The San Rafael Gas & Electric Light Company has been incorporated by C. E. Green, of San Francisco, and S. B. Cushing, Allan Lee, E. G. Stetson and N. M. Gordon, with a capital stock of $200,000.

Grand Rapids, Mich.—It is understood that the legal difficulties in the way of the local Edison Company have been removed, and that the plant will go into operation at once. It will be remembered that the old company obtained under its exclusive franchise from the city an injunction to stop the Edison Company from doing business.

St. Johnsbury, Vt.—The St. Johnsbury Standard Electric Light Company is busy these days. A mill plant was shipped this week to Tilton, N. H., and the plant for the town of Tilton, which this company has the contract for, is under way. Mill plants for Peterboro and Ashland, N. H., have also been put in by the electric company.—*Mfrs. Gaz.*

Wichita, Kan., has given to the Wichita Schuyler Electric Light Co. a three years' contract for lighting the streets, together with an order for additional lights. Although it is said that the land boom at Wichita has dropped off, there are more electric lights being put in every day, and facts have demonstrated that the place can live and prosper without such land sales as have taken place in the last few years.

Utilization of the Treadmill.—The treadmill is quite a prominent feature in English prison economy, and it is interesting that the prison authorities there are considering the possibility of utilizing the treadmill power, which is at present allowed to waste, either in the way proposed of transmitting the power directly by electricity or by storing it through the agency of secondary batteries for lighting purposes.

Allegheny City, Pa.—The Allegheny Electric Light Company, of Allegheny City, Pa., have just completed machinery that increases their lighting capacity to 13,500 lamps. They recently added 2,500 lamps to the plant, and are now running 11,000, which is something of an increase over the 150 which they had one year ago last March. At a meeting of the stockholders of the company held last week a dividend of 3 per cent. was declared.

Mission Ridge, Tenn.—There has been some question among the electrical manufacturing companies as to any good results coming from an exhibition of their lights at the fairs throughout the country. The Schuyler Company, however, are firm believers that with a good system good results will accrue, and as an evidence of this they cite the sale of a large arc plant to the Mission Ridge Land Company, at Chattanooga, Tenn., which came through the Piedmont Fair exhibit of the Schuyler system.

Knoxville, Tenn.—The Schuyler Electric Co., at Knoxville, Tenn., has bought an additional arc dynamo and soon proposes to break ground for a new station and a large incandescent plant. The company is deserving of great credit in this progress, as it was some time before the Knoxville people fully appreciated the electric light and gave the company sufficient patronage to pay its way. The good service of this company, however, has convinced them that there is money in it, and they have now taken hold with that same enterprise which they have shown booming their beautful city.

Fredericksburg, Va.—The Rappahannock Electric Light and Power Company, of Fredericksburg, operating the Thomson-Houston system, now has running one 50 and one 30 light arc machines, with thirty-five arc lights, nineteen 65 c. p., one 32 and seventeen individual distributors. The power is obtained from a water-wheel, and is furnished by the Water Power Company. The demand for the light is steadily increasing. The officers of the company are: O. Watson, President, W. E. Horton, Vice-President, and Henry Souther, Secretary and Treasurer. These are directors, with C. M. McNett and E. I. Garfield.

Cairo, Ill.—The Brush Electric Light and Power Company have another dynamo as large as their first one on hand, and are making room at their works on Ninth street to put it in position to use when they need it. Since the adoption of the new schedule of prices on electric lights, rumor has been that the two companies would reduce expenses by running their dynamos by the same power, and it is possible they will, although it has not been so settled yet. The contract Mr. Galigher has to furnish power to the Thomson-Houston plant runs out on January 1st, but we understand there are several bids to furnish their power.—*Cairo Argus.*

Electric Lighting in the South.—Mr. C. M. McNett, in a communication to the *Manufacturers' Record*, gives a long list of places in the South which have either put in the Thomson-Houston system during the last few months, or have increased their plants of that system, such as Durham, N. C.; Greensboro, N. C.; Staunton, Va.; Petersburg, Va.; Manchester, Va.; West Point, Va.; Fredericksburg, Va.; Parkersburg, W. Va., and Charleston, W. Va. Several of these plants will shortly include the alternating system, which has in fact already been started with success at West Point, Va. Staunton is running 100 incandescents in series with arc lights with good results.

Springfield, O.—The large Mather incandescent and Waterhouse arc plant for the great machine works of the Warder, Bushnell & Glassner Company has been put in under the direction of Mr. W. N. Gray, of Cincinnati, who had the contract for placing the dynamos, circuits, &c. Mr. C. A. Bauer, the general manager of the works, has also given the matter his personal attention. The object of putting in the plant is to increase the regular working time for the winter from 8 hours to 10 daily, and to be able to run all night when occasion demands. These lights—about 1000 incandescents and 30 arcs—are distributed through the works, which comprise 6 great shops and 47 different departments. The plant is to be running this week.

Belmont, N. Y.—Clark & Bros., the manufacturers of the Mayo system of electric lighting, write as follows: "Our foundry and blacksmith shop were destroyed by fire on the morning of Jan. 5. No damage was done to any other part of our plant. Having a large stock of castings on hand, and the main portion of our patterns having been saved, and with arrangements for procuring what castings we may need until our foundry is rebuilt, there will be no stoppage of work in our machine department, and no serious delay in filling orders. While the embers are still smoldering the work of rebuilding has been begun, and we expect in a few weeks to be better equipped than ever for supplying the wants of our customers."

East Lake, Tenn.—The large Schuyler dynamo which was built for the Piedmont Exposition, and which was purchased by the Mission Ridge Land Company after taking the first prize at the big Atlanta Fair, has been put in position at East Lake, and will be in operation by Jan. 15, when the entire lake grounds and all the streets and avenues leading to it will be lighted with arc lights. The dynamo operates 35 arc lights, besides enough incandescents to supply all the houses at the lake or in the vicinity. The company's property is being improved as rapidly as possible, and new houses are going up every day. Mr. Franklin Harris says they are going to keep on with work until East Lake is made the handsomest resort in the South.—*Chattanooga Times.*

Fort Wayne-Jenney Plant at Utica, N. Y.—A fine plant of the Fort Wayne-Jenney system was started last week at Utica, and the streets of that city are now entirely lighted by arc lamps, under a three years' contract granted to the New York Electric Construction Company, represented by Messrs. A. L. Soulard and J. H. Hapgood. The city lighting takes eleven 35-lighters, and nine more dynamos of like capacity are being put in for commercial work. Messrs. McDonald and G. A. Wilbur supervised the work for the parent company. The engine is a Corliss of 600 h. p. There are 4 boilers of 150 h. p. each, put in by Cunningham Bros., of Boston. The shafting was supplied by D. Frisbie & Co., of New York. Altogether the plant and the construction work are the best of their kind. Mr. A. Barkum has charge of the station, and Mr. W. H. Reynolds is the consulting engineer.

San Antonio, Tex.—A special dispatch of recent date, from San Antonio, says: "San Antonio may at present be said to be an electrical muddle. The San Antonio Gas Company, several months ago, after a very spirited effort, secured a contract from the council to light the city with electric lights, the plant to be in operation by the first of January. It will be remembered that the gas company was enjoined on the 1st inst. by the Western Union Telegraph Company and the San Antonio Electric Light and Power Company, of Louisiana, a rival corporation, now erecting its poles and stretching its wires on Commerce street. For fear of injury to the telegraph lines now occupying the street, the gas company proceeded to erect the poles on other streets of the city and was to-day enjoined by the Erie Telegraph and Telephone Company, so that it seems impossible for the gas people to carry out their contract. It has been discovered since the injunction proceeding was instituted that the water-works never obtained the necessary right for occupying the streets of San Antonio, and the gas people now threaten, as a retaliatory measure, to demand that the Western Union wire be ousted from the city. Great interest is felt by all classes of citizens in the squabble, and its outcome will be watched with anxiety."

APPLICATIONS OF POWER.

On a Swedish Farm.—The use of electricity as a motor is spreading in all directions. The latest is that a Swedish farmer has hit upon the ingenious idea of lighting his farm by electric light, having purchased a dynamo and connected it with a waterfall close by. At present the machine is only used for lighting, but the man intends also to employ it for working threshing machines, etc. The light has been found cheaper than paraffin oil.—*Industrial World.*

New York City.—At the third meeting of the Rapid Transit Committee, at the Murray Hill Hotel, last week, the electric motor people were given a hearing and a great many interesting facts elicited, which were listened to attentively. All the statements made are taken down stenographically, and will be published later on in a report. President Bracken, of the Julien Company, presented the storage battery side of the case. Attention was also called to underground conductors. Col. R. R. Hazard has also appeared before the committee.

Printing by Electricity.—The following is from the Richmond, Va., *Dispatch* of Dec. 18: One of the wonders of electricity was seen at the *Times* office last evening. With a rapidity that seemed hardly controllable, a small machine—an infant in appearance by the side of the steam engine—was running the printing press, and paper after paper poured forth, and the *Times* in its this morning's issue may be certainly said to be "struck by lightning." The machine itself is scarcely more than two feet square; noiseless in its motion but powerful in its force. The sparks and flashes of the subtle fluid that set this mystery in motion were sent by the Schuyler Electric Light Company, and in spite of this extra service the electric lights of the city were as brilliant as ever.

Baltimore, Md.—J. G. Brill & Co., of Philadelphia, have finished for the Electric Storage Company, of this city, the car to be run by electricity over the street car tracks of Baltimore, and when the motors are completed in New York, they and the car will be shipped to Baltimore and sent to the stables of the Frick car line, on Boundary avenue, where they will be tested. The car is 16 feet long, larger than the ordinary street car, and is much handsomer. It will be fitted with electric bells instead of the gong and strap arrangement and an alarm bell, and will be lighted by four 16 candle-power incandescent electric lamps. The electric power will be generated by fourteen cases of the Faure-Sellon-Volckmar storage battery, each case containing nine cells. These will be placed under the seats, seven on each side, and connected with two 7½ horse-power Sprague motors, making 15 horse-power in all, enabling the car to go up the steepest grade in the city at the maximum speed allowed by law, and if necessary the cars can be run at twelve miles per hour. The storage batteries are being made at the laboratory of the Electric Storage Company, at the works of the United States Electric Light and Power Company, corner of Centre and Holliday streets. Mr. J. Frank Morrison is the general manager of the organization, and Mr. James R. Clark president. As soon as the car and motors are tested a public exhibition will be given. The experimenters are very confident of success, and think their batteries and motors will in a short while entirely replace horses in street-car work.—*Baltimore Sun.*

PERSONALS.

Mr. E. G. Acheson is the recipient at Pittsburgh of many inquiries regarding his new thermo-electric generator, illustrated in our columns last week.

Mr. R. Grimshaw contributed to the Jan. 1 issue of the New York *World* an admirably full, pithy and pointed summary of the scientific work and progress of the past year. Electrical applications occupied no less than one column.

MISCELLANEOUS NOTES.

Detroit, Mich.—The Michigan Electric Service Company, of Detroit, has been incorporated by Mr. J. C. Grout and others with a capital stock of $50,000.

Hose Signals.—The Crosby Electric Hose Signal Company has been incorporated at Portland, Me., by E. H. Crosby and others, with a capital stock of $500,000.

The Edison Phonograph.—It is stated by the London *Electrician* that Col. Gouraud, who is a personal friend of Mr. Edison, and is now in England, will in a few weeks enter into regular phonographic correspondence with him.

A Big California Project.—A project is on foot in California for utilizing the water-power of Lake Tahoe by means of an immense siphon. It is believed 100,000 horse-power can be obtained, which would be distributed to various localities through the medium of electricity.

Exposing a Spiritualistic Seance.—On Sunday evening Dr. L. W. Sapp, of Cleveland, O., held at the Adelphi Hall in this city a meeting for spiritual manifestations, with some practical illustrations of "occult telegraphy." The novelty of the subject attracted the attention of G. A. Mudgett and W. S. Price, operators in this city, who accordingly attended the meeting, and they soon exposed the trickery that was being employed

in this new system. After the exposure, the audience slowly and sadly dispersed. Inquisitive operators do not fit in well with spiritualistic seances.

Applied Electricity at Cornell.—A few weeks ago a thief at Cornell was neatly caught when he went to obtain a $10 note, part of which was protruding from the pocket of a vest hanging in an unoccupied room. A professor had connected the vest with an electric bell. The victim made a clean breast of his depredation.

The American Electrical Works, of Providence, has, in accordance with its usual practice, issued for 1888 a very tasteful and pretty calendar of decidedly electrical character. A feature of the calendar itself is that it shows the quarters of the moon. Altogether this is a valuable as well as ornamental publication, and at once finds its conspicuous place on the wall.

Electric Working of Metals.—It is stated that the Dresdner Bank has acquired the right for Germany of working the de Benardos and Olszewski method of welding metals, and that the Rothschilds hold the rights for France, Belgium, Spain, Italy and Austria. A writer in one of our English contemporaries regards this process as very unsatisfactory in its results, and describes some of them.

Utilizing Niagara.—Mr. John F. Kearns, who has an invention for utilizing the water-power of the Niagara River, has been granted by the Government the use of 500 feet on the river to test his invention. He expects to secure the prize of $100,000 offered for the best device of the kind. His method is to anchor large floats in which are paddles to be driven by the stream and to be connected up with dynamos, etc.

A Change of Form.—The *Iron Age*, which is the oldest paper in the world devoted to the hardware, iron and metal trades, and is now in its forty-first volume, has now been made into a handsome quarto, in which the reading matter is separated from the advertisements. It is a giant among the weekly technical papers of the country, and its 146 pages contain pretty well every thing of note or value, whether in the shape of reading matter or of advertisements.

Underground Wires for Boston.—The city committee on underground wires in Boston "believe it would be unwise to compel the electric wire companies operating in Boston to place their wires underground in separate conduits, and that the city must either construct a subway for the reception of all electrical conductors or contract with some conduit company to construct underground conduits of sufficient capacity to receive all surface wires in operation."

A Valuable Journal.—The publishers and editors of THE ELECTORAL WORLD, of this city, may justly pride themselves, says the *Mechanical News* of Jan. 1, on the growth and present completeness of that valuable journal. They have issued a tasteful pamphlet giving an outline of the history of the paper for the fourteen years of its existence, with engravings showing the ample facilities it now enjoys in its offices in the magnificent Potter Building on Park Row.

How the Lightning Stroke Feels.—The Rev. C. E. Cline writes to a religious paper describing his sensations when struck by lightning, or rather when struck by a piece of plaster that the lightning stroke had dislodged from the ceiling. He says that he saw "a great multitude of most beautiful children running towards him and waving their hands, and shouting greetings of joy." He does not trace any direct connection between the lightning stroke and the children, but says he believes that on that night he entered heaven. Without intending to be irreverent it may be remarked that this way of reaching glory, though expeditious, is hardly pleasant.

Execution by Electricity.—Commenting upon the intended report of the New York capital punishment commission in favor of electricity as the lethal agent, the New York *Tribune* comes out strongly in support of electrical methods of execution and says that "Humanity and justice alike counsel the execution of so tremendous a sentence in the most swift and painless manner, and also in the most certain manner. This is what the proposed adoption of electricity as an agent signifies, and if it is carefully and scientifically applied, there can be little doubt that the example of New York State will be followed by all civilized communities."

BUSINESS NOTICES.

A Link Belt Testimonial from the Edison Electric Illuminating Co.—

NEW ORLEANS, La., Dec. 22, 1887.

Messrs. Chas. A. Schieren & Co., New York:

DEAR SIRS: I am in receipt of your inquiry as to our experience with the link belt which you sent us on trial.

I have great pleasure in saying that it has given, and is giving, the greatest possible satisfaction.

I was greatly surprised, on coming to this country in 1885, to find that link belts were unknown, as I had had three years' experience with them in England, where the Edison Company, and nearly all the other companies, had adopted them and used them exclusively for all plants of any considerable size.

As long ago as January, 1883, we tried the first link-belt on an Edison plant in London, of which I was then in charge, and it gave such satisfactory results that they were immediately adopted, and the second order was for the most important plant the Edison Company then had—viz., the Houses of Parliament. Subsequently the plant was enlarged and link belts were put all through and are running to this day.

It is well to bear in mind that these results were obtained with the old fashioned link belt with the straight iron rivets right through. Your patent joint in the centre is, of course, a great improvement, as we do not have to wait until the rivets become concave by wear.

I was very glad to hear in June last from your local agents that you were prepared to supply link belts, as they were just what I had been waiting for.

Our belts here run about 4,500 feet per minute and transmit about 75 h. p., and, although this is a severe test, I have seen them doing still harder work, and traveling at higher speeds, with the best results.

Suffice it to say that as soon as our other seven belts wear out I shall replace them all with link belts, for the reason that besides doing better service, with much greater reliability and far less strain on the bearings, I have found that they will outlast three or four ordinary leather belts.

Since your link belt has been running here it has been the wonder and admiration of all the electric light men and practical machinists who have seen it.

We are now putting in an additional engine and shall be glad if you will send us for the same two link belts, same as last supplied, one to be 43 feet and the other to be 58 feet long. Each 10 inches wide.

You are at liberty to make any use you may desire of the above, and I shall take great pleasure in recommending your link belts to any inquirers. Yours very truly,

for THE EDISON ELECTRIC ILLUMINATING COMPANY.

WM. T. M. MOTTRAM, Superintendent.

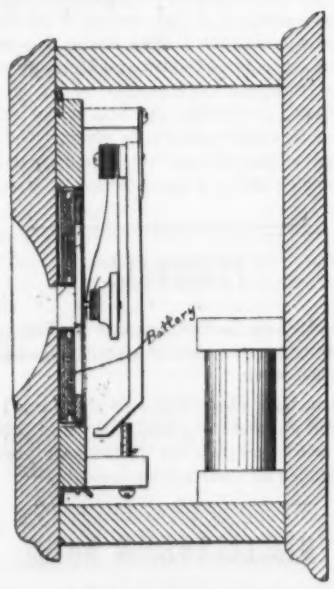
Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolt cap and set screws, taps, dies, files, twist drills, brass and rubber tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED JANUARY 3, 1888

375,727. Electrical Synchronous Movement; H. C. Bridger, New York, N. Y., Assignor to Josiah Quincy and A. L. Parcelle, Boston, Mass. Application filed Feb. 15, 1886. The invention consists in connecting the rotating circuit completer in synchronous multiplex telegraph instruments with its driving mechanism by means of a frictional or yielding connection, so that the running of the instruments shall be steady and accurate.

(1) 375,749. Permanent Magnet for Electrical Apparatus; (2) 375,750. Armature for Magneto-Electric Machines; (3) 375,751. Magneto-Electric Machine; Wm. Humans, of Cambridge, Mass., Assignor to the American Magnetic Electric Co., of Jersey City, N. J. Application filed July 23, 1885. (1) This is a compound permanent magnet whose elements form a case or box, the opposite poles being on



375,862. TELEPHONE.

opposite sides or ends of the box. (2) The end pieces of the armature are inserted into recesses in the ends of the armature. (3) Structural details relating to magneto generators.

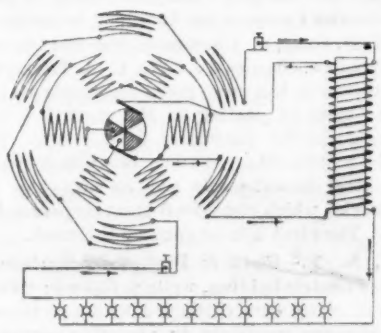
375,756. Lightning Rod; S. R. Lawshe, Chicago, Ill. Application filed Aug. 24, 1887. A centre rod or wire is surrounded by several outside wires. They are all separated from one another by a copper sheathing or web.

375,766. Telegraph Register; J. G. Noyes, of New York, N. Y., Assignor to the New Haven Clock Company, of same place. Application filed Oct. 11, 1887. Improvements in the manner of connecting the line wires with the magnets. L-shaped strips are used, one end being connected with line and the other sliding against contact posts.

375,784. Apparatus for Electric Welding; E. Thomson, Lynn, Mass. Application filed July 25, 1887. The object of this invention is to provide an apparatus which will preserve the shape of the article welded. That is, in welding wheel tires the ends of the tire are led toward each other and pressed together through circular paths. See illustration.

375,835. Electric Exercising Machine; E. W. Robinson, C. H. O'Brien and H. M. Breen, Portland, Me. Application filed April 1, 1887. A magneto generator is arranged in connection with a pulling apparatus in such a manner that the pull of the cords rotates the armature, thereby producing an electric current, which is conducted by suitable wires throughout the body of the operator.

375,862. Telephone; V. M. Berthold, Cambridge, Assignor to the American Bell Telephone Co., of Boston, Mass. Application filed April 2, 1887. This is a telephone having a gal-



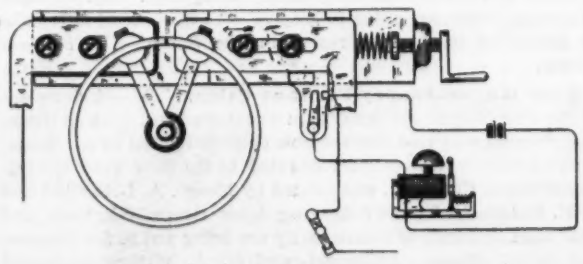
375,910. REGULATING ALTERNATE CURRENT ELECTRIC GENERATORS.

vanic battery located between the mouth-piece or sound-opening and the microphone contact. See illustration.

375,869. Backing Electrotype Shells; J. R. Cummings, Chicago, Ill., Assignor to the American Press Association, same place. Application filed June 23, 1886. Molten metal is applied to the shell and then the back at once scraped off with a sharp straight-edge.

375,876. Conduit for Electrical Conductors and Power Cables; Isaac La Rue Johnson, Washington, D. C. Application filed May 9, 1887. The conduit has lateral auxiliary water-tight conductor chambers, through which currents of hot or cold air are passed. Fans force the air in, and drain pipes convey away any precipitated moisture.

375,898. Duplex Telegraphy; Charles Selden, Baltimore, Md. Application filed Oct. 10, 1884. The receiving magnet core has wound upon it an auxiliary static neutralizing coil



375,784. APPARATUS FOR ELECTRIC WELDING.

in a local circuit. A pole-changer controls the circuit of the coils and is momentarily actuated at the instant of the static charge and discharge.

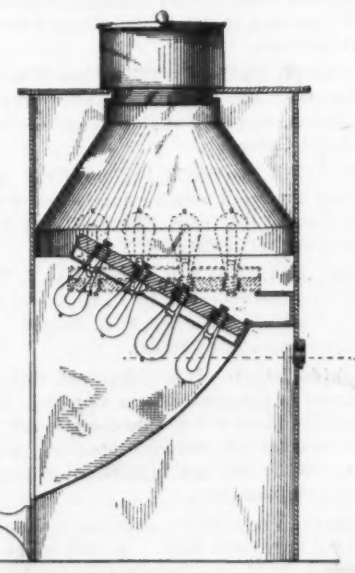
375,910. Regulating Alternate Current Electric Generators; K. Zipernowsky, Buda-Pesth, and M. Déri, Vienna, Austria-Hungary. Application filed Dec. 16, 1886. The field magnets are excited by the combined action of two currents of different origin. One is the regular exciting current and the other is produced by the main current through induction in a transformer. See illustration.

375,915. Electrical Heater; J. P. Barrett and J. F. Mehren, Chicago, Ill. Application filed Jan. 27, 1887. In a case or stove provided with suitable heat reflectors a number of incandescent lamps are arranged. They furnish both light and heat to the apartment in which the apparatus is located. See illustration.

375,925. Telephone System; J. Crawford and J. B. Ker, Harrisburg, Pa. Application filed March 24, 1887. A double switch-board, consisting of two boards placed back to back and both provided with plug holes. The jacks are between the boards and permanently attached to but one of them, so that the boards may be detachably secured together.

375,952. Covered or Insulated Wire; L. F. Requa, New York, Assignor, by mesne assignments, to the Safety Insulated Wire and Cable Company. Application filed April 25, 1887. The wire is covered with a tubular coating of a pyroxyline compound strengthened or sustained by a braided web.

375,977. Supporting Arm for Electric Lights; D. B. Banks and G. K. Hutchins, Baltimore, Md. Application filed April 5, 1887. To the top of a mast is pivoted a series of sec-



375,915. ELECTRICAL HEATER.

tions which constitute a "lazy tongs." The lamp is hung at the outer end.

376,007. Electric Arc Lamp; Wm. H. Miller, New York, N. Y. Application filed June 16, 1884. The invention covers various details of a focusing lamp. The upper carbon is controlled in its downward movement by a clutch connected with the stem of a dash-pot.

376,018. Electric Therapeutic Device; E. R. Whitney, St. Johnsbury, Vt., Assignor to the Standard Electric Co., same place. Application filed Aug. 31, 1887. The device is in the shape of a dumb-bell, the centre portion telescoping and the two parts forming the primary and secondary of an induction coil. By pressing the two balls together the strength of the current is increased, and *vice versa*.

376,019. Mold for Forming Pieces of Carbon for Electric Purposes; C. H. Wilder, Natick, Mass., Assignor to the Hub Carbon Co., Kennebunk, Me. Application filed Feb. 26, 1887. The mold has a lining of graphite paper laid against a sheet metal lining.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.